



Transport
for NSW

ANNUAL NSW SPEED CAMERA PERFORMANCE REVIEW

NSW Centre for Road Safety

JULY 2012

Contents

Executive summary	3
Introduction	5
Speed camera programs in NSW	7
Evaluation criteria	8
Evaluation method	9
Results and discussion	13

Appendices

Appendix A: Analysis of the NSW mobile speed camera program

Appendix B: Analysis of the NSW red-light speed (safety) camera program

Appendix C: Analysis of the NSW fixed speed camera program

Appendix D: Analysis of the NSW point-to-point enforcement program

Executive summary

In response to the Auditor-General's recommendation the NSW Government announced the *NSW Speed Camera Strategy* on 1 June 2012. The strategy outlines how speeding impacts upon the community, how sites are selected for the four types of speed cameras used in NSW, and how speed camera performance will be monitored and reported on an annual basis. The strategy was developed in consultation with the NSW Police Force and NRMA Motoring and Services.

This report summarises the analysis undertaken by the NSW Centre for Road Safety for the first annual speed camera review against criteria outlined in the strategy. This action also meets the NSW Auditor-General's recommendation to provide the community with information about the road safety impact of speed cameras.

The purpose of the *Annual NSW Speed Camera Performance Review* is to provide a systematic process for monitoring the effectiveness of speed cameras to ensure they are having a positive road safety effect. Where it is determined a camera has not been effective, other road safety alternatives will be considered. The findings from this annual review will guide the planning of future speed enforcement priorities and operations.

The evaluation criteria for each camera type outlined in the strategy has been determined by the NSW Centre for Road Safety based on the road safety benefit that is expected to be achieved from the program. Broadly speaking camera effectiveness is measured by two key criteria:

- The impact the speed camera has on slowing drivers down and therefore reducing crashes and casualties, and
- The impact the speed cameras have on achieving greater speed compliance through a reduction in infringement rates.

A more detailed explanation of evaluation criteria and the methodology for assessing camera performance is outlined in the document.

Key findings for each camera type

Mobile speed cameras

An analysis of fatality trends for the first 12 months of the mobile speed camera program found that mobile speed cameras contributed to a 19 per cent statistically significant reduction in fatalities on NSW roads in the first year of the program. The ongoing impact of the mobile speed camera program is reflected in the 2011 road toll of 376 which represents the second lowest annual figure since 1944 (with 371 fatalities, the lowest recorded in 2008; 374 fatalities) and a continued suppression of speeding observed in on-road speed surveys which shows a general decrease in the proportion of vehicles exceeding the speed limit across most speed zones. Crash and speed survey data indicate there has been an increase in speeding on high speed roads and therefore this will be a future focus of the mobile speed camera program.

Red-light speed (safety) cameras

There are 91 intersections across NSW that have red-light speed camera enforcement; 46 intersections were issuing infringements for both red-light and speeding offences and 45 intersections in warning mode for speeding offences up to 30 km/h in 2011. Given the program is still in its infancy in NSW it is too early to evaluate camera effectiveness at individual locations because in most instances enforcement has been conducted for less than one year.

Overall, at the 91 intersections there has been a 21 per cent reduction in crashes and a 26 per cent reduction in casualties at these locations since the cameras were installed comparing with a five year period prior to installation. When this is compared with evaluations of a similar program in Victoria, early results for the NSW program indicate that the expected road safety benefits are being achieved.

Point-to-Point speed camera enforcement

A large proportion of the point-to-point enforcement program was rolled out during 2011, therefore it is still too early to evaluate the effectiveness of most of the lengths. Of the 24 lengths that are part of the program, two point-to-point lengths were installed in 2010, 13 lengths were installed during 2011 and the remaining nine will

be rolled out in 2012 and 2013. Of these lengths only one – Great Western Highway between Meadow Flat and Raglan – enforced for the entire 2011 review period. In the period 2005 to 2009 there were 11 heavy vehicle crashes resulting in one fatality and eight injuries at this location. In 2011, there were three heavy vehicle crashes, resulting in one casualty at this location which indicates that early results are encouraging for the enforcement length.

Infringement data for average speed offences in point-to-point enforcement lengths show a high level of compliance within the enforcement lengths and a low number of infringements. This is consistent with evaluations of point-to-point programs operating in other jurisdictions.

Fixed speed camera program

A total of 97 fixed speed camera locations have been reviewed, with 88 found to have been effective from the initial analysis. Overall, when comparing the five years before the fixed speed cameras were installed to the current five year analysis period, the fixed speed camera program has delivered a 38 per cent reduction in the number of crashes resulting in an 87 per cent reduction in fatalities and a 37 per cent reduction in injuries at camera locations.

There are nine locations that were identified for further review based on the crash analysis criteria outlined in the report. Including:

- Northern Distributor, Corrimal,
- New South Head Road, Edgecliff,
- Pacific Highway, Hungry Head,
- New England Highway, Kootingal,
- New England Highway, Lochinvar,
- F3 Freeway, Ourimbah,
- Pacific Highway, Valla Beach,
- Pacific Highway, Wardell,
- Castle Hill Road, West Pennant Hills.

Desktop reviews were undertaken for these locations to gain an understanding of what occurred at each location. Based on the desktop reviews, four locations were deemed effective and five were recommended for comprehensive field reviews to be undertaken by the NSW Centre for Road Safety. Including:

- Northern Distributor, Corrimal,
- New South Head Road, Edgecliff,
- Pacific Highway, Hungry Head,
- New England Highway, Kootingal
- New England Highway, Lochinvar.

As part of the review, the fixed speed camera at New South Head Road, Edgecliff will be considered for a red-light speed (safety) camera because a large number of crashes at this location occurred at a nearby intersection.

If during the field reviews it is determined that any camera is not delivering the expected safety benefits at the location, it will be recommended for removal and possible relocation.

The NSW Centre for Road Safety will continue to annually review all individual speed cameras as well as the overall performance of speed camera programs as set out in the *NSW Speed Camera Strategy*. These reviews will be annually published to ensure that the programs remain transparent to the community.

Introduction

In response to the Auditor-General's recommendation the Government announced the *NSW Speed Camera Strategy* which provides an integrated framework for speed enforcement in NSW and aims to improve the transparency and understanding of the use of speed cameras in NSW through increased community engagement and education. The *NSW Speed Camera Strategy* reinforces the Government's commitment to reducing fatalities on NSW roads.

One of the key actions outlined in the *NSW Speed Camera Strategy* is the annual publication of camera performance against criteria outlined in the Strategy. This action also meets the NSW Auditor-General's recommendation to provide the community with information about the road safety impact of speed cameras.

The purpose of the *Annual NSW Speed Camera Performance Review* is to present the results of performance evaluations carried out on each of the speed camera programs in NSW. The Auditor-General found that the right speed camera in the right place can save lives. Cameras not delivering the expected road safety benefits will be monitored and evaluated and if not considered to be effective will be removed or relocated. The findings from this report will guide the planning of future speed enforcement operations.

The speeding problem

Speeding, which encompasses excessive speed (driving above the speed limit) or inappropriate speed (driving too fast for the prevailing conditions), is unquestionably recognised as a major contributing factor in both the number and severity of traffic crashes.

Speeding increases the risk of having a crash, and increases the risk of serious injury or death in the event of a crash. In addition to car occupants, our roads are used by vulnerable road users such as pedestrians. Studies of survival and impact speed show that small increases in travel speed can result in large increases in braking distances and impact speed and as a result substantially increasing the risk of a pedestrian being killed or seriously injured.

Effectiveness of camera enforcement

Speed camera enforcement is an important road safety initiative that has proven road safety benefits. Speed enforcement helps to reduce the proportion of drivers who exceed the speed limit on our roads, which in turn reduces the risk of being involved in a fatal or injury crash and the severity of outcomes in the event of a crash.

Speed enforcement activities aim to increase the perceived threat of being caught speeding and in doing so help to reduce the mean travel speed on our roads, and therefore reducing the risk of being involved in a fatal or injury crash for all road users. Automated camera enforcement supplements enforcement conducted by police and the NSW Police Force routinely requests locations to be considered for automated speed enforcement. Speed cameras are commonly employed methods of speed enforcement in many best practice road safety jurisdictions throughout the world.

The various types of speed cameras have different roles. In NSW, fixed speed cameras (including red-light speed and point-to-point cameras) are located at specified road lengths or intersections where there is a demonstrated crash history or where speed is considered to be a problem. Mobile speed cameras can be moved around the network at various times and locations and, like police enforcement, this mobility increases the deterrence effect due to the unpredictability of the exact location of speed enforcement.

Changing driver behaviour

Speed cameras are used to change driver behaviour, which can be measured by changes in infringements over time. An example of this trend is illustrated in Figure 1 which depicts the number of infringements per month since the commencement of enforcement at three high profile fixed speed camera locations. This pattern shows an initial high number of infringements followed by a rapid and sustained decrease in infringements as drivers modify their behaviour which is reflected in a reduction in crashes over time.

Appendix C contains this type of infringement graph for every fixed speed camera location. Infringement numbers follow this trend at many locations however in some locations the initial few years of infringement volumes are missing because data for pre July 2004 is not currently published on the Office of State Revenue website. The Centre for Road Safety is currently collating this information and it will be available for future reporting.

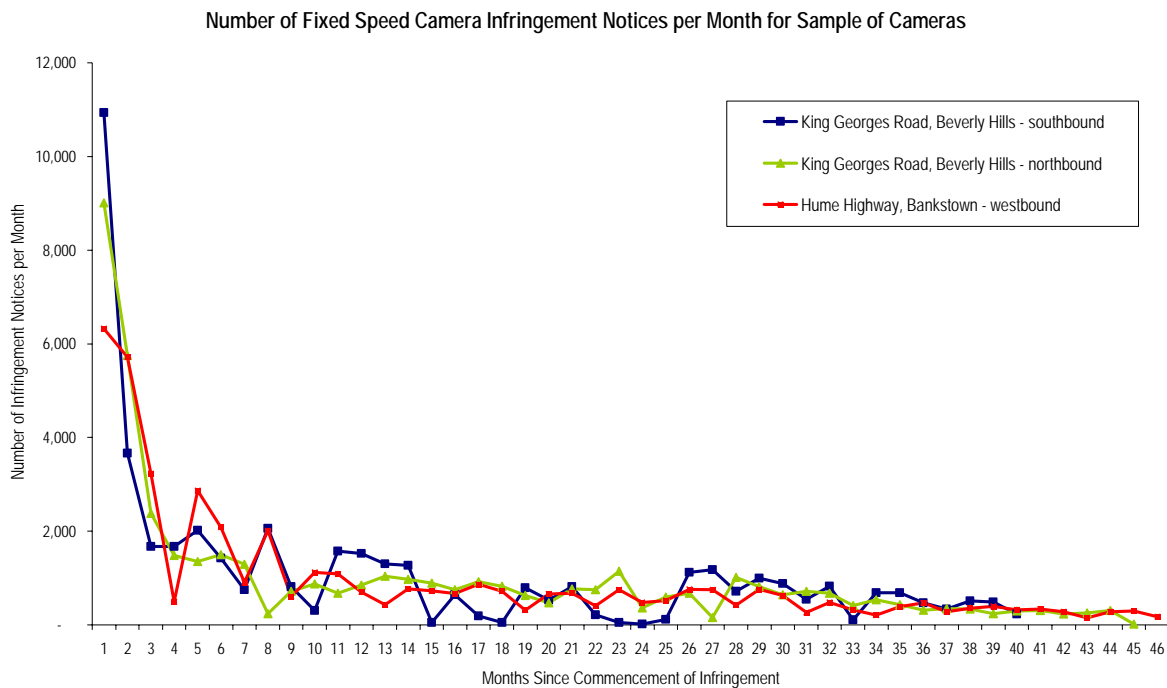


Figure 1: Example of trend in speed camera infringements over time.

Speed camera programs in NSW

Speed cameras are speed enforcement tools that supplement enforcement conducted by the NSW Police Force. They have been proven to make roads safer by reducing speeding and in turn the number and severity of crashes. Table 1 shows the four types of speed cameras used in NSW.

Speed cameras used in NSW			
Type	Main purpose	Introduced	Current size of NSW program
Fixed	Location specific (To address black spot/high risk)	1997	139 cameras at 110 locations (7 in warning mode)
Red-light Speed (safety)	Location specific (To address high risk intersections)	2009	106 cameras at 91 intersections
Mobile	General network deterrence	First introduced in 1991. Ceased operation in December 2008 and re-introduced in 2010	642 locations Approx. 930 hours of enforcement per month
Point-to-Point	Route enforcement (For heavy vehicles only)	2010	24 lengths

Table 1: Types of speed camera enforcement in NSW as at 1 June 2012.

Fixed speed cameras

Fixed speed cameras are located at specified road lengths where there is a high crash risk or a demonstrated crash history.

Red-light speed (safety) cameras

Red-light speed (safety) cameras are also location-specific as they address speeding and red-light running at signalised intersections where drivers and pedestrians are vulnerable to right angle crashes.

The NSW Police Force previously managed wet-film red-light cameras at 183 intersections across the Sydney, Newcastle and Wollongong metropolitan areas. These cameras were becoming outdated and used obsolete technology and the program was handed over to the former Roads and Transport Authority in December 2008. Red-light speed cameras were introduced in late 2009 to replace some of these wet film locations as well as new intersections.

Mobile speed cameras

Mobile speed cameras produce a sustained change in driver behaviour by creating a perception that speeding can be enforced anywhere at any time. Therefore they reduce speeding not only at identified enforcement locations but also across the road network. This is because drivers are less able to predict where the enforcement will occur; the less predictable the enforcement, the more broadly speed limit compliance can be achieved and the greater the crash problem that is addressed. Mobile speed cameras can be moved around the road network at various times and locations.

Point-to-point enforcement

Point-to-point enforcement addresses speeding along travel routes with a demonstrated history of crashes. Point-to-point enforcement in NSW targets heavy vehicles as they are over-represented in crashes on known heavy vehicle routes. Point-to-point enforcement works by measuring the amount of time it takes a heavy vehicle to travel between two points and then calculating the average speed of the vehicle. If the vehicle's average speed is faster than the speed limit for the length of road, the driver will be infringed for speeding.

Evaluation criteria

The ultimate indicator of performance for all speed cameras in NSW is a reduction in people killed and injured in crashes. The following tables outline the criteria that have guided the evaluation of speed cameras in NSW as well as the overall effectiveness of the *NSW Speed Camera Strategy*.

Enforcement type	Evaluation data	Measure of effectiveness
Mobile speed cameras	Annual speed surveys	Reduction in vehicles exceeding speed limit across the road network/ random sample of locations
	Compliance data	Increase in compliance rates/Reduction in infringement rates
	Crash data	Reduction in crashes and casualties across NSW
Red-light speed (safety) cameras	Speeds	Reduction in vehicles exceeding speed limit at intersection
	Compliance data	Increase in compliance at intersection/Reduction in infringement rates
	Crash data	Reduction in casualties and crashes at intersection
Fixed speed cameras	Speeds	Reduction in vehicles speeding within 500 metres of the camera
	Compliance data	Increase in compliance at camera location/Reduction in infringement rates
	Crash data	Reduction in casualties and crashes within 500 metres of the camera
	Risk	Level of risk continues to be reduced at the location (for example low level of speeding and/or crashes in tunnels)
Point-to-Point enforcement	Speeds	Reduction in heavy vehicle speeding within enforcement length
	Compliance data	Increase in compliance within the enforcement length/Reduction in infringement rates
	Crash data	Reduction in crashes within enforcement length

Table 2: Criteria for measuring camera effectiveness.

Program	Outcome
Mobile speed camera	Reduction in road trauma, speed-related crashes and speeding across the whole road network
Red-light speed (safety) camera	Reduction in frequency and severity of crashes at enforced intersections (and at all signalised intersections due to deterrent effect across the network)
Fixed speed	Reduction in vehicles speeding and the frequency or severity of crashes at fixed speed camera locations
Point-to-Point	Reduction in speeding and the frequency or severity of crashes on point-to-point enforcement lengths

Table 3: Criteria for measuring overall effectiveness of enforcement programs.

Evaluation method

2011 Road toll data

The crash data used in this annual review are for crashes which occurred between 1 January 2011 to 31 December 2011. It is important to note that this is still preliminary data. Annual road toll statistics are not finalised until around nine months after the end of the calendar year. This is because of the time lag involved with the receipt of late reports and the processing of exclusions arising from Coronial inquiry determinations. Based on the experience from previous years, the final road toll for 2011 is expected to be around three per cent lower than the provisional road toll figure.

The crash statistics recorded by Transport for NSW and included in this annual review are confined to those crashes which conform to the national guidelines for reporting and classifying road vehicle crashes and are based on the following criteria:

- 1 The crash was reported to the police
- 2 The crash occurred on a road open to the public
- 3 The crash involved at least one moving road vehicle
- 4 The crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

More information about how crash data is processed in NSW is available online at www.centreforroadsafety.nsw.gov.au.

Speed camera data

The red-light speed camera and point-to-point enforcement programs are in their early stages, having only been operational for two years or less. Given the infancy of the programs, the data analysed in this annual review will not be sufficient to reliably assess the effectiveness of individual camera locations. Typically at least five years of crash and casualty data are required to make a statistically significant assessment of a camera's effectiveness.

The data assessed in this review, therefore will only provide preliminary indications of any changes in driver behaviours as a result of these programs.

Mobile speed cameras

Due to the mobility of mobile speed cameras and their purpose of creating a general deterrence effect across the road network (as opposed to a fixed location enforced by other speed cameras), the current analysis does not examine individual mobile speed camera locations. The analysis examined crash data for the entire state.

The analysis of the mobile speed camera program is available at Attachment A.

Red-light speed (safety) cameras

The current analysis provides crash data for the five year 'before' period, ending 91 days before the commencement date as this is the period in which the camera was under construction. The 'after' period is from the commencement date to the end of 2011. Red-light speed cameras operate in warning mode for a period prior to issuing infringements. Crash data for the calendar year 2011 is also given for those intersections whose enforcement commenced prior to 2011.

Crash data were examined at each red-light speed camera for all crashes that occurred within 10 metres of the red-light speed camera intersection. The current analysis has been conducted by intersection, rather than by camera. There are currently a total of 106 red-light and red-light speed (safety) cameras operating at 91 intersections around Sydney, Newcastle and Wollongong. Therefore, 15 intersections have two cameras.

Additional technical notes for the analysis of red-light speed cameras:

1. Crashes are assigned to the traffic signal controlled intersections enforced. An intersection crash is one which occurs within, or up to 10 metres from, an intersection. Initially crashes geo-coded as within 90 metres of the Traffic Control System (TCS) feature and that occurred at an intersection were selected.
2. These were viewed and attributed to the intersection under analysis taking into account the geo-coding as well as the values in the street name, the ID feature, and the intersection type fields.
3. Where unclear, the correct location of the crash was confirmed or inferred from the original police report.
4. The commencement of the warning letter period is listed for each camera. For the analysis of intersections with two cameras, the 'after' period began with the earlier commencement date.
5. The crash and casualty graph only contains complete years data. Where there is less than one year of post installation data, they are not graphed however they are described in text.
6. Data for the following crash analysis have not been ranked and are presented alphabetically on the location description of the camera location. The combined crash rate and casualty rate reductions are based on the annual averages in crashes and casualties at each location before and after the cameras were installed.

The analyses of red-light speed camera locations are available at Attachment B.

Fixed speed cameras

In early 2011 (prior to the audit of speed camera programs) there were 172 cameras operating at 141 locations. When the audit was released in July 2011, the Minister for Roads and Ports directed the deactivation of the 38 cameras that were found to not be delivering the expected road safety benefit. Safety reviews have now been conducted at these locations and a program of alternative works will be implemented at these locations prior to the cameras being removed. Cameras at seven of these locations remain in warning mode following concerns expressed by the community. Given the recent review of these cameras they are not considered in the 2011 report but will continue to be monitored during 2012.

The current review is of the remaining 103 locations. Of these locations, six locations have not been considered because they are located in tunnels and no pre-installation data are available. The current analysis has been conducted by fixed speed camera location, rather than by camera. There are currently a total of 131 fixed speed cameras operating at 103 locations across NSW. Therefore, 28 locations have two cameras. One of these locations (F6, Gwynneville) has two cameras operating approximately 1,000 metres apart, and infringing in different directions, therefore these cameras were directionally analysed as separate locations.

The current analysis examined crash data of each fixed speed camera for 500 metres either side of non-school zone cameras or patch to patch (i.e. the length of road designated as a school zone, as identified by the start and end patches marked on the road) for all school zone cameras. For locations with more than one camera in operation (where cameras are less than 100 metres apart), the crash analysis length was for 500 metres either side of the mid-point of the two cameras.

Locations for which cameras were installed based on the high risk criteria have been analysed for the 2011 calendar year only, as there is no before data for analysis (typically tunnel locations).

Additional technical notes for the analysis of fixed speed cameras:

1. The commencement date listed for each location refers to the month and year that the fixed speed camera commenced infringement at that location. For locations where more than one fixed speed camera is in operation, the date listed refers to the month and year that the *first camera* started infringing at that location unless specified otherwise.
2. For each location, the 'before' and 'after' periods vary depending on the date the camera commenced infringement, and excluded the three month period directly before the commencement date. For each location, the 'before' period was defined as the five year period up to three months prior to the commencement date of camera infringements, and the 'after' period was defined as the most recent five year period.

3. Analysis of some recently installed school zone locations was necessarily based on shorter before and after time periods (i.e. one-year or two-year periods).
4. Data for the following crash analysis have not been ranked and are presented alphabetically on the location description of the camera location.
5. The crash and casualty numbers for the combined before and after analysis of fixed speed cameras are based on the five years before the cameras were installed, and the most recent five year analysis period for each camera location. In instances where there was less than five years of data since the camera was installed, the five year before data was adjusted so that it reflected an average number of crashes and casualties over an equivalent time period (e.g. four years). In circumstances when there was less than five years of data prior to the installation of the speed camera, the before period was adjusted so that it represented an equivalent five year period.

Criteria for recommendations based on the current analysis:

Along with before and after crash analysis of NSW fixed speed camera locations, the current report lists a recommendation for each location based on the current analysis. The camera location is listed as either:

- a) Delivering the expected road safety benefits.
- b) Recommended for review.

a) Locations listed as delivering the expected road safety benefits

Fixed speed camera locations have been classified as being effective and delivering the expected road safety benefits if the current crash analysis satisfies any one of the following criteria:

1. There is a lower number of total casualties and the same or lower number of crashes in the after period compared to the before period, and no fatalities in the after period.
2. There is the same number of total casualties but a lower number of total crashes in the after period compared to the before period, and no fatalities in the after period.
3. If there was at least one fatality in the before or after period, the combined cost to the community of fatalities and injuries in the after period is less than the combined cost in the before period. This acknowledges the greater cost to the community of fatalities compared to injuries. The estimated cost of road crash casualties is calculated using the willingness to pay methodology, which reflects the accumulated value the NSW community is willing to pay or forgo in exchange for a reduction in the probability of crash related injuries and road crash deaths on NSW roads. According to willingness to pay, casualty costs are \$5.834 million per fatality, and \$0.114 million per injury (Roads and Traffic Authority, 2009).
4. Fixed speed cameras have been installed in tunnels and other areas under the "high risk" site selection criteria. For these locations, there are no available data in the before period due to there being no crash history prior to camera implementation. However, any crash that occurs in these areas would have potentially catastrophic consequences due to difficulties of access by ambulance and emergency vehicles to the crash site.

b) Locations identified for review

Fixed speed camera locations have been identified for review if the current crash analysis satisfies any one of the following criteria:

1. There is a higher number of both total casualties and total crashes in the after period compared to the before period.
2. There is a higher number of total casualties in the after period compared to the before period, and the same number of total crashes in both before and after periods.
3. There is a higher number of total casualties but a lower number of total crashes in the after period compared to the before period, and no fatalities in the after period.
4. There is a slightly lower number of total casualties but a higher number of total crashes in the after period compared to the before period, and no fatalities in the after period.
5. There is the same number of total casualties, and the same number of total crashes, in both before and after periods (and no fatalities in the after period).
6. If there was at least one fatality in the after period, the combined cost to the community of fatalities and injuries in the after period is greater than the combined cost in the before period. This acknowledges the greater cost to the community of fatalities compared to injuries (with calculations based on the willingness to pay methodology, as already outlined).

7. Major road works such as curve re-alignment or highway duplication have significantly improved safety at the existing location.

Where a fixed speed camera location satisfied any of these criteria, a further desktop review of the location was conducted, to determine the appropriateness of the recommendation. This analysis considered the trend in casualty crashes, the circumstances of fatal crashes at the location and the specific types of crashes that occurred at the location. Where there was additional information which indicated the camera was effective, this is indicated in the report.

The analyses of fixed speed camera locations are available at Attachment C.

Point-to-point enforcement

A large proportion of the point-to-point enforcement program was rolled out during 2011. Of the 24 lengths that are part of the program, two point-to-point lengths were installed in 2010, 13 lengths were installed during 2011 and the remaining nine are being rolled out in 2012 and 2013. Of these lengths only one – Great Western Highway between Meadow Flat and Raglan – enforced for the entire 2011 review period.

The current analysis provides crash data for the five year period prior to the length commencing enforcement and available data for the period after the length was activated in warning period.

The analysis of the point-to-point speed camera program is available at Attachment D.

Speed survey data

Vehicle speeds were assessed at a state level. Vehicle speeds are assessed through annual speed surveys undertaken by the NSW Centre for Road Safety at the same locations every year. These speed surveys are conducted across NSW on a range of roads with a range of speed limits to gather current information about speeding behaviour of both light and heavy vehicles. In 2011 annual speed surveys were conducted at 164 locations across NSW.

The annual speed surveys measure free travel speeds, with a headway of four seconds. That is, only the speeds of vehicles that are unimpeded by other traffic are measured, therefore the survey provides a measure of the speed that drivers choose to travel rather than a measure of traffic congestion.

Speed surveys in 2011 were not undertaken at specific speed camera enforcement locations, therefore infringement data is being used as a proxy for speed data in this review.

Speed surveys will be undertaken at a sample of speed camera enforcement locations in the future so that speeding behaviour can be assessed for these programs.

Infringement data

Infringement data analysed in this report includes all penalty notices detected by Roads and Maritime Services red-light and speed cameras from July 2004 onwards (no infringement data is available prior to this date). Infringement data are publically available through the Office of State Revenue (<http://www.osr.nsw.gov.au/about/corporate/statistics/>).

Results and discussion

This review has found that overall, speed cameras are continuing to improve road safety in NSW. However three of the four programs are still in their infancy and a better understanding of the longer term effectiveness of these programs will require ongoing monitoring of their performance by the NSW Centre for Road Safety into the future.

Early results show that drivers are changing their behaviour, which overall is resulting in a reduction in crashes and casualties at camera locations and across the road network.

Key findings

Mobile speed cameras

The analysis of the mobile speed camera program is available at Attachment A.

In August 2011, a review of the NSW mobile speed camera program found that in the first year of operation the program contributed to a 19 per cent statistically significant reduction in fatalities throughout NSW. This represents a saving of 84 lives and an estimated community saving of around \$490 million.

The ongoing impact of the mobile speed camera program is reflected in the provisional 2011 road toll. The provisional 2011 road toll is 376 persons killed on NSW roads. This result is the second lowest annual figure since 1944 (with 371 fatalities). The lowest recorded road toll in 2008 with 374 fatalities.

Speed survey results in 2011 show a continued suppression of speeding compared to 2008 and 2009, although there was a slight increase in speeding in most speed zones for light vehicles compared to 2010. With a few exceptions the results for heavy vehicles follow a similar trend to that of light vehicles, although generally a lower proportion of heavy vehicles exceed the speed limit.

While the results are generally positive, the results in 100 km/h zones showed there was an increase in speeding in 2011 compared to the period 2008 to 2010. These results coincide with an increase in the proportion of fatalities in 100km/h zones that are speed related. In 2010, 38 per cent (63 of 167) of fatalities in 100km/h speed zones were speed related, in 2011 46 per cent (71 of 154) were speed related. This increase in speed related crashes in 100 km/h zones supports that the zones should be the target of future mobile speed camera enforcement.

Notwithstanding this, the trend in road fatalities and annual speed surveys demonstrates that the small-scale interim mobile speed camera program is delivering positive road safety benefits. The reduction in travel speeds observed in the annual speed surveys provide strong evidence that the general deterrence provided by the re-introduction of mobile speed cameras have contributed to the reduction in fatalities.

In 2011 there were a total of 16,544 infringements resulting in a total fine revenue of \$2.58 million from mobile speed camera enforcement. The trend for infringements show two increases in the volume which coincide with an increase in the number of sites used for enforcement in those months. In the months following the use of new sites, the number of infringements decreased or stabilised. This trend is anticipated to continue as the program is expanded.

The mobile speed camera program will be expanded in the coming years to about 45 marked vehicles operating for 7,000 enforcement hours per month at around 2,500 locations. This way forward aims to increase the general deterrence of speeding, which is expected to deliver continued reductions in crashes and casualties and reductions in vehicles exceeding the speed limit.

Given the high proportion of speed-related crashes occurring on high speed roads, there will be a greater focus on deploying mobile speed cameras to high speed regional and rural roads to further drive down the road toll. These changes to the mobile speed camera program will be supported by improvements to mobile speed camera signage and markings to ensure that speed enforcement is fair and transparent.

Red-light speed (safety) cameras

The analyses of red-light speed camera locations are available at Attachment B.

Overall, at the 91 red-light speed (safety) camera intersections there has been a 21 per cent reduction in crashes and a 26 per cent reduction in casualties at these locations since the cameras were installed comparing with a five year period prior to installation. When this is compared with the evaluation of a similar program in Victoria early results for the NSW program indicate that the expected road safety benefits are being achieved.

In 2011 there were a total of 156,790 infringements resulting in a total fine revenue of \$42.08 million at red-light speed camera intersections, however at this stage cameras have not been in operation for long enough for there to be a meaningful trend in infringements. It is expected that red-light running and speeding at red-light speed (safety) camera intersections will decrease over time, thereby reducing the number of infringements and fine revenue at these locations. This was recently shown in an evaluation undertaken by the Centre for Automotive Safety Research in South Australia¹, which found that in the first year of operation, red-light speed cameras resulted in a decrease in red-light running and speeding over time. While red-light running decreased slowly over time, speeding decreased more rapidly. This demonstrates an improvement in driver behaviour as a result of red-light speed (safety) cameras.

While early results for these 91 locations are encouraging, it is too early to conclusively determine the effectiveness of individual locations and therefore no recommendations for review are proposed in the 2011 report. Typically at least five years of crash and casualty data are required to make a statistically significant assessment of a camera's effectiveness.

Fixed speed cameras

The analyses of fixed speed camera locations are available at Attachment C.

A total of 97 fixed speed camera locations have been reviewed, with 88 found to have been effective from the initial analysis. Overall, when comparing the five years before the fixed speed cameras were installed to the current five year analysis period, the fixed speed camera program has delivered a 38 per cent reduction in the number of crashes resulting in an 87 per cent reduction in fatalities and a 37 per cent reduction in injuries at camera locations. In the five years before the cameras were installed there were 3,959 crashes, resulting in 61 fatalities and 2,124 injuries. In the current five year analysis period there were 2,451 crashes, resulting in eight fatalities and 1,344 injuries.

In 2011 there were a total of 313,849 infringements issued resulting in a total fine revenue of \$51.32 million at fixed speed camera locations. Compared to 2010, this is a reduction of 60,085 infringements and \$6.06 million in revenue. These data show that speeding behaviour has significantly reduced at many speed camera locations since they were introduced.

There were nine locations that were identified for further review based on the crash analysis criteria used. These locations were: Northern Distributor, Corrimal; New South Head Road, Edgecliff; Pacific Highway, Hungry Head; New England Highway, Kootingal; New England Highway, Lochinvar; F3 Freeway, Ourimbah; Pacific Highway, Valla Beach; Pacific Highway, Wardell; Castle Hill Road, West Pennant Hills. Desktop reviews were undertaken for these locations to gain an understanding of what occurred at each location.

Based on the desktop reviews, four locations were deemed effective and five were recommended for comprehensive field reviews to be undertaken by the NSW Centre for Road Safety. These locations are: Northern Distributor, Corrimal; New South Head Road, Edgecliff; Pacific Highway, Hungry Head; New England Highway, Kootingal and New England Highway, Lochinvar.

Safety reviews involve examining crash history, traffic volumes, road conditions, land use and high risk user behaviour near the fixed speed camera location. Safety reviews also involve the consideration of road safety issues raised by the community in regard to the locations. If during the review it is determined that the camera

¹ Mackenzie, J.R.R., Kloeden, C.N., and Hutchinson, T.P. (2012) *Analysis of infringement data from fixed red light and speed cameras at signalised intersections in South Australia*, Report No. CASR071, Centre for Automotive Safety Research, The University of Adelaide, South Australia.

is not delivering the expected safety benefits at the location, it will be recommended for removal and possible relocation.

If a camera is recommended for removal, alternative road safety treatments that are suitable to address any road safety issues will be investigated. Alternative treatments may involve improved signage, road works, traffic facilities, speed zoning reviews and targeted communications.

Point-to-point speed cameras

The analysis of the point-to-point speed camera program is available at Attachment D.

It is too early to assess the effect of point-to-point enforcement on the 24 program lengths, as 13 lengths were installed in 2011, with another nine being installed in 2012/13. Only Great Western Highway between Meadow Flat and Raglan enforced for the entire 2011 review period. In the period 2005 to 2009 there were 11 heavy vehicle crashes resulting in one fatality and eight injuries. In 2011 there were three heavy vehicle crashes resulting in zero fatalities and one injury. During 2011, 14 speeding infringements were issued at this length.

A total of 289 speeding infringements were issued resulting in a total fine revenue of \$83,782 at point-to-point lengths in 2011. Infringement data for average speed offences in point-to-point enforcement lengths show a high level of compliance within the enforcement lengths and a low number of infringements. This is consistent with results in other point-to-point programs. Numerous studies have shown that point-to-point enforcement is typically associated with very high rates of compliance with posted speed limits even when traffic volume is high². For example, rates of compliance associated with point-to-point enforcement (light and heavy vehicles) on the Hume Highway, Victoria have been reported at 1 – 2 per cent (Cameron 2008 in Soole et al 2011).

Future of NSW speed camera programs

The NSW Centre for Road Safety will continue to annually review all individual speed cameras as well as the overall performance of speed camera programs as set out in the *NSW Speed Camera Strategy*. These reviews will be annually published to ensure that the programs remain transparent to the community.

The fixed speed camera program continues to provide positive road safety benefits to the locations where they are installed, and will be annually assessed to ensure they continue delivering a positive road safety benefit.

While the red-light speed, mobile speed and point-to-point speed camera programs are still in their infancy, early results are encouraging with some evidence of changes in driver behaviour. This is also reflected in an improvement in the provisional road toll for 2011. It is expected that the expansion of the red-light speed and mobile speed camera programs will deliver even greater results than the small scale programs that operated in 2011. While statistically significant analyses of these programs will not be possible for a few more years, the NSW Centre for Road Safety will continue to annually monitor their performance.

The NSW Centre for Road Safety recognises that opportunities exist to review major travel routes against criteria for each camera type to ensure that any speed cameras placed along the length are delivering the expected benefits and are the most appropriate camera type for the type of speeding behaviour being observed. This will support the NSW Police Force in conducting traditional speed enforcement on these routes. In the coming year the NSW Centre for Road Safety will also review the Federal Highway, the Kings Highway, the Princes Highway, the New England Highway and the F3 Freeway to identify locations where the use of speed camera enforcement will reduce crashes and improve safety.

² Soole, D. W., Fleiter, J. and Watson, B. (2011) *Point-to-point speed enforcement: A technological overview, review of the empirical evidence and recommendations for better practice*, Draft final report for Austroads Steering Committee, Austroads, Sydney, Australia.

Summary of actions

Over the next year the following actions will be undertaken:

- Safety reviews will be conducted at five speed camera locations and if found to not be delivering the expected safety benefits they will be recommended for removal and possible relocation.
- The rollout of an initial 500 new high-risk mobile speed camera locations, with further high risk locations to be assessed and prioritised (including community nominated sites made via the Safer Roads website at www.saferroadsnsw.com.au).
- The rollout of enhanced mobile speed camera signage and markings. An additional warning sign will be placed before a mobile speed camera giving motorists up to 250 metres advance warning of a camera, rather than the current 50 metres. Mobile speed camera vehicles will also have more identifiable markings.
- The rollout of an expanded mobile speed camera program: from six to about 45 vehicles by July next year, operating at around 2,500 locations for 7,000 hours per month.
- The rollout of enhanced red-light speed (safety) camera signage (by the end of August 2012). Warning signs for red-light speed cameras will be clearer, and more than double in size.
- The rollout of an expanded red-light speed (safety) camera program from 91 to 200 by the end of 2014.
- Installing point-to-point enforcement of heavy vehicle speeding on two new lengths of the Pacific Highway, from Tyndale to Harwood, and Wardell to Ballina.
- Review the Federal Highway, the Kings Highway, the Princes Highway, the New England Highway and the F3 Freeway to identify locations where the use of speed camera enforcement will reduce crashes and improve safety.